<u>Amendments</u>

Please amend the above-identified application as follows:

In the Claims:

Please replace claims 1, 2, 12, 16, 17, 23, 24, 25, 31, 36, 37 & 38 as set forth below. All pending claims are reproduced below for the Examiner's convenience.

1. (Amended) A method for encoding a frame having a plurality of macroblocks, said method comprising:

using intraframe statistics to determine without reference to another frame whether said frame includes a random noise portion and a normal video portion, and if so, then for each macroblock of said frame:

(i) determining a macroblock activity level;

(ii) determining when said macroblock activity level exceeds a predefined threshold, wherein said macroblock activity level exceeding said predefined threshold indicates that said macroblock is associated with said random noise portion of said frame; and

(iii) adjusting encoding of said macroblock when said macroblock activity level exceeds said predefined threshold to conserve bits used in encoding said macroblock by biasing coding of said

macroblock associated with said noisy portion of said frame towards predictive coding and thereby save bits otherwise used to encode said random noise portion of said frame and provide a more constant picture quality due to encoding of the frame.

2. (Amended) The method of claim 1, wherein said method comprises using said saved bits from said random noise portion of said frame to encode macroblocks associated with said normal portion of said frame.

3. The method of claim 1, wherein each macroblock of said plurality of macroblocks comprises multiple blocks, and wherein said determining (i) comprises determining an activity level for each block of said multiple blocks of said macroblock, and deriving therefrom an activity level for said macroblock.

4. The method of claim 3, wherein said deriving comprises ordering activity levels of said multiple blocks of said macroblock and comparing a minimum activity level of said order with a next to minimum activity level of said order to derive said activity level for said macroblock.

5. The method of claim 4, wherein said comparing further comprises comparing said minimum activity level of said order with an average activity level of said multiple blocks of said macroblock to derive said activity level for said macroblock.

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6.   A method for encoding a frame having a plurality of
macroblocks, said method comprising:

determining whether said frame includes a noisy
portion, and if so, then for each macroblock of said
frame:

(i)   determining a macroblock activity level;

(ii) determining when said macroblock
activity level exceeds a predefined threshold,
wherein said macroblock activity level exceeding
said predefined threshold indicates that said
macroblock is associated with said noisy portion
of said frame; and

(iii)   adjusting encoding of said macroblock
when said macroblock activity level exceeds said
predefined threshold to conserve bits used in
encoding said macroblock and thereby save bits
otherwise used to encode said noisy portion of
said frame;

wherein each macroblock of said plurality of
macroblocks comprises multiple blocks, and wherein said
determining (i) comprises determining an activity level
for each block of said multiple blocks of said
macroblock, and deriving therefrom an activity level
for said macroblock;

wherein said deriving comprises ordering activity
levels of said multiple blocks of said macroblock and

comparing a minimum activity level of said order with a next to minimum activity level of said order to derive said activity level for said macroblock;

wherein said comparing further comprises comparing said minimum activity level of said order with an average activity level of said multiple blocks of said macroblock to derive said activity level for said macroblock; and

wherein said comparing comprises determining whether said minimum activity level is less than one-half said next to minimum activity level and whether said minimum activity level is less than one-half said average activity level of said multiple blocks, and when both are so, defining said activity level of said macroblock as said next to minimum activity level of said order, otherwise defining said activity level of said macroblock as said minimum activity level of said order.

6. The method of claim 1, wherein said adjusting encoding (iii) comprises performing motion estimation on said macroblock and selectively adjusting macroblock coding type for said macroblock to bias said macroblock towards being coded predictive when said macroblock activity level exceeds said predefined threshold, said selectively adjusting being with reference to a predictive error value resulting from said performing motion estimation on said macroblock.

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8. A method for encoding a frame having a plurality of macroblocks, said method comprising:

using intraframe statistics to determine without reference to another frame whether said frame includes a noisy portion, and if so, then for each macroblock of said frame:

(i) determining a macroblock activity level;

(ii) determining when said macroblock activity level exceeds a predefined threshold, wherein said macroblock activity level exceeding said predefined threshold indicates that said macroblock is associated with said noisy portion of said frame; and

(iii) adjusting encoding of said macroblock when said macroblock activity level exceeds said predefined threshold to conserve bits used in encoding said macroblock and thereby save bits otherwise used to encode said noisy portion of said frame;

wherein said adjusting encoding (iii) comprises performing motion estimation on said macroblock and selectively adjusting macroblock coding type for said macroblock to bias said macroblock towards being coded predictive when said macroblock activity level exceeds said predefined threshold, said selectively adjusting being with reference to a predictive error value

resulting from said performing motion estimation on said macroblock; and

wherein said selectively adjusting comprises determining when said predictive error is greater than a second predefined threshold and said predictive error is greater than one-half said macroblock activity level, and when both are so, adjusting a macroblock coding type parameter to bias said macroblock towards being coded predictive.

9. The method of claim 1, wherein said adjusting encoding (iii) comprises determining an adjusted quantization level for use in encoding said macroblock, said adjusted quantization level being determined to conserve bits used in encoding said macroblock when said macroblock activity level exceeds said predefined threshold.

14. A method for encoding a frame having a plurality of macroblocks, said method comprising:

using intraframe statistics to determine without reference to another frame whether said frame includes a noisy portion, and if so, then for each macroblock of said frame:

(i)   determining a macroblock activity level;

(ii)   determining when said macroblock activity level exceeds a predefined threshold, wherein said macroblock activity level exceeding said predefined threshold indicates that said

macroblock is associated with said noisy portion
of said frame; and

(iii) adjusting encoding of said macroblock
when said macroblock activity level exceeds said
predefined threshold to conserve bits used in
encoding said macroblock and thereby save bits
otherwise used to encode said noisy portion of
said frame;

wherein said adjusting encoding (iii) comprises
determining an adjusted quantization level for use in
encoding said macroblock, said adjusted quantization
level being determined to conserve bits used in
encoding said macroblock when said macroblock activity
level exceeds said predefined threshold; and

wherein said determining of said adjusted
quantization level comprises calculating a quantization
level (CAL QL) for said macroblock and defining said
adjusted quantization level (ADJ QL) as:

ADJ QL=MIN((1 + 0.25 (TH2 - BR + 1))·CAL QL; MAX ALLOWED BY STANDARD)

Where: BR is the target bitrate;
       TH2 is a second predefined value; and
       MAX QL ALLOWED BY STANDARD is a maximum
       quantization level allowed by MPEG standard

12. (Amended) The method of claim 1, wherein said
determining whether said frame comprises said random noise
portion includes calculating a frame complexity value and
comparing said frame complexity value to a predefined
complexity threshold.

13. The method of claim 12, wherein said frame comprises a plurality of pixels, and wherein each pixel of said frame comprises a multi-bit value, and wherein said frame complexity value comprises an accumulated absolute difference value (PIX-DIFF) derived from adjacent pixels of said plurality of pixels of said frame.

14. A method for encoding a frame having a plurality of macroblocks, said method comprising:

using intraframe statistics to determine without reference to another frame whether said frame includes a noisy portion, and if so, then for each macroblock of said frame:

(i) determining a macroblock activity level;

(ii) determining when said macroblock activity level exceeds a predefined threshold, wherein said macroblock activity level exceeding said predefined threshold indicates that said macroblock is associated with said noisy portion of said frame; and

(iii) adjusting encoding of said macroblock when said macroblock activity level exceeds said predefined threshold to conserve bits used in encoding said macroblock and thereby save bits otherwise used to encode said noisy portion of said frame;

wherein said determining whether said frame comprises said noisy portion includes calculating a frame complexity value and comparing said frame complexity value to a predefined complexity threshold;

wherein said frame comprises a plurality of pixels, and wherein each pixel of said frame comprises a multi-bit value, and wherein said frame complexity value comprises an accumulated absolute difference value (PIX-DIFF) derived from adjacent pixels of said plurality of pixels of said frame; and

wherein said PIX-DIFF is defined as:

$$\sum_{y=1,3,5...}^{Max} |L_y - L_{y+1}|$$

Where: L represents luminance value of a pixel, and y represents pixel position within the frame.

15. The method of claim 13, further comprising setting a noisy picture flag to "0" when said frame complexity value is less than said predefined complexity threshold, wherein said flag set to "0" designates said frame as a non-noisy or normal frame.

16. (Amended) The method of claim 13, wherein said determining whether said frame comprises said random noise portion further includes comparing a target bitrate for said frame to a predefined bitrate threshold and when said target bitrate for said frame exceeds said predefined bitrate threshold, said method further comprises setting a noisy

picture flag equal to "0", wherein said flag set to "0" designates said frame as a non-noisy or normal frame, and if said target bitrate is less than said predefined bitrate threshold, then setting said noisy picture flag to "1", wherein said "1" noisy picture flag setting indicates said frame includes said random noise portion.

16. (Amended) A method for encoding a frame of a sequence of frames, each frame having a plurality of macroblocks, said method comprising:

using intraframe statistics to determine without reference to another frame whether said frame includes a random noise portion and a normal video portion; and

when said frame includes said random noise portion and said normal video portion, evaluating each macroblock of said plurality of macroblocks in said frame and adjusting encoding of at least some macroblocks thereof within said random noise portion of said frame, said adjusting comprising reducing bits used in encoding said at least some macroblocks within said random noise portion by biasing coding thereof towards predictive coding.

17. The method of claim 16, wherein each frame of the sequence of frames comprises a plurality of pixels, each pixel of each frame comprising a multi-bit value, and wherein said determining whether said frame includes said random noise portion includes calculating a frame complexity value and comparing said frame complexity value to a

predefined complexity threshold, said calculating of said
frame complexity value including deriving an accumulated
absolute difference (PIX-DIFF) from adjacent pixels of said
plurality of pixels of said frame.

19. A method for encoding a frame of a sequence of
frames, each frame having a plurality of macroblocks, said
method comprising:

determining whether said frame includes a random
noise portion; and

when said frame includes said random noise
portion, evaluating each macroblock of said plurality
of macroblocks in said frame and adjusting encoding of
at least some macroblocks thereof within said random
noise portion of said frame, said adjusting comprising
reducing bits used in encoding said at least some
macroblocks within said random noise portion;

wherein each frame of the sequence of frames
comprises a plurality of pixels, each pixel of each
frame comprising a multi-bit value, and wherein said
determining whether said claim includes said random
noise portion includes calculating a frame complexity
value and comparing said frame complexity value to a
predefined complexity threshold, said calculating of
said frame complexity value including deriving an
accumulated absolute difference (PIX-DIFF) from
adjacent pixels of said plurality of pixels of said
frame; and

wherein said deriving of said PIX-DIFF comprises forming a string of pixels by concatenating said plurality of pixels of said frame and defining PIX-DIFF as:

$$\sum_{y=1,3,5...}^{Max} |L_y - L_{y+1}|$$

Where: L represents luminance value of a pixel, and y represents pixel position within the string of pixels.

20. The method of claim 18, wherein when said frame complexity value is less than said predefined complexity threshold, said method further comprises setting a noisy picture flag to "0" and performing normal encoding on said frame, wherein said flag set to "0" designates said frame as a non-noisy or normal frame, and wherein when said frame complexity value is greater than said predefined complexity threshold, said method further comprises determining whether a target bitrate of said frame is less than a predefined bitrate threshold, wherein when said target bitrate of said frame exceeds said predefined bitrate threshold, said method comprises setting said noisy picture flag to "0", and when said target bitrate of said frame is less than said predefined bitrate threshold, said method comprises setting said noisy picture flag to "1", wherein said "1" noisy picture flag setting indicates that said frame includes said random noise portion.

21. The method of claim 17, wherein said evaluating comprises for each macroblock determining a macroblock activity level and determining when said macroblock activity level exceeds a predefined activity threshold, wherein said

macroblock activity level exceeding said predefined activity threshold indicates that said macroblock is within said random noise portion of said frame.

22. The method of claim 21, wherein said adjusting encoding comprises performing motion estimation on said macroblock and selectively adjusting macroblock coding type for said macroblock to bias said macroblock towards being coded predictive when said macroblock activity level exceeds said predefined activity threshold, said selectively adjusting being with reference to a predictive error value resulting from said performing motion estimation on said macroblock, and further comprising determining an adjusted quantization level for said macroblock for use in encoding said macroblock, said adjusted quantization level being determined to reduce bits used in encoding said macroblock.

23. (Amended) The method of claim 17, wherein said reducing bits comprises conserving bits used in encoding said at least some macroblocks within said random noise portion for use within said normal video portion of said frame.

24. (Amended) A system for encoding a frame comprising a plurality of macroblocks, said system comprising:

means for using intraframe statistics to determine without reference to another frame whether said frame includes a random noise portion and a normal video portion, and if so, then for each macroblock of said frame:

(i)   means for determining a macroblock activity level;

(ii)   means for determining when said macroblock activity level exceeds a predefined threshold, wherein said macroblock activity level exceeding said predefined threshold indicates that said macroblock is associated with said random noise portion of said frame; and

(iii)   means for adjusting encoding of said macroblock when said macroblock activity level exceeds said predefined threshold to conserve bits used in encoding said macroblock by biasing coding of said macroblock associated with said random noise portion of said frame towards predictive coding and thereby save bits otherwise used to encode said random noise portion of said frame and provide a more constant picture quality due to encoding of the frame.

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25.   (Amended) The system of claim 24, wherein said system further comprises means for using said saved bits from said random noise portion of said frame to encode macroblocks associated with said normal portion of said frame.

26.   The system of claim 24, wherein each macroblock of said plurality of macroblocks comprises multiple blocks, and wherein said means for determining (i) comprises means for determining an activity level for each block of said multiple blocks of said macroblock, and means for ordering

activity levels of said multiple blocks of said macroblock and comparing a minimum activity level of said order with a next to minimum activity level of said order to derive an activity level for said macroblock.

27. A system for encoding a frame comprising a plurality of macroblocks, said system comprising:

means for determining whether said frame includes a noisy portion, and if so, then for each macroblock of said frame:

(i) means for determining a macroblock activity level;

(ii) means for determining when said macroblock activity level exceeds a predefined threshold, wherein said macroblock activity level exceeding said predefined threshold indicates that said macroblock is associated with said noisy portion of said frame; and

(iii) means for adjusting encoding of said macroblock when said macroblock activity level exceeds said predefined threshold to conserve bits used in encoding said macroblock and thereby save bits otherwise used to encode said noisy portion of said frame;

wherein each macroblock of said plurality of macroblocks comprising multiple blocks, and wherein said means for determining (i) comprises means for

determining an activity level for each block of said multiple blocks of said macroblock, and means for ordering activity levels of said multiple blocks of said macroblock and comparing a minimum activity level of said order with a next to minimum activity level of said order to derive an activity level for said macroblock; and

wherein said means for comparing comprises means for determining whether said minimum activity level is less than one-half said next to minimum activity level and whether said minimum activity level is less than one-half an average activity level of said multiple blocks, and when both are true, for defining said activity level of said macroblock as said next to minimum activity level in said macroblock, otherwise for defining said activity level of said macroblock as said minimum activity level of said order.

26. The system of claim 23, wherein said means for adjusting encoding (iii) comprises means for performing motion estimation on said macroblock and for selectively adjusting macroblock coding type for said macroblock to bias said macroblock towards being coded predictive when said macroblock activity level exceeds said predefined threshold, said selectively adjusting being with reference to a predictive error value resulting from said performing of motion estimation on said macroblock.

28. A system for encoding a frame comprising a plurality of macroblocks, said system comprising:

means for determining whether said frame includes a noisy portion, and if so, then for each macroblock of said frame:

(i)   means for determining a macroblock activity level;

(ii)   means for determining when said macroblock activity level exceeds a predefined threshold, wherein said macroblock activity level exceeding said predefined threshold indicates that said macroblock is associated with said noisy portion of said frame; and

(iii)   means for adjusting encoding of said macroblock when said macroblock activity level exceeds said predefined threshold to conserve bits used in encoding said macroblock and thereby save bits otherwise used to encode said noisy portion of said frame;

wherein said means for adjusting encoding (iii) comprises means for performing motion estimation on said macroblock and for selectively adjusting macroblock coding type for said macroblock to bias said macroblock towards being coded predictive when said macroblock activity level exceeds said predefined threshold, said selectively adjusting being with reference to a predictive error value resulting from said performing of motion estimation on said macroblock; and

wherein said means for selectively adjusting comprises means for determining when said predictive error is greater than a second predefined threshold and when said predictive error is greater than one-half said macroblock activity level, and when both are so, said means for selectively adjusting comprises means for adjusting a macroblock coding type parameter to bias said macroblock towards being coded predictive.

30. The system of claim 29, wherein said means for adjusting encoding (iii) further comprises means for determining an adjusted quantization level for use in encoding said macroblock, said adjusted quantization level being determined to conserve bits used in encoding said macroblock when said macroblock activity level exceeds said predefined threshold.

31. (Amended)   A system for encoding a frame of a sequence of frames, each frame having a plurality of macroblocks, said system comprising:

a pre-encode processing unit for using intraframe statistics to determine without reference to another frame whether said frame includes a random noise portion and a normal video portion; and

a control and encode unit for evaluating each macroblock of said plurality of macroblocks in said frame when said frame includes said random noise portion, said control and encode unit including means for adjusting encoding of at least some macroblocks within said random noise portion of said frame to

reduce bits used in encoding said at least some
macroblocks within said random noise portion by biasing
coding thereof towards predictive coding.

32. The system of claim 31, wherein each frame of the
sequence of frames comprises a plurality of pixels, each
pixel of each frame comprising a multi-bit value, and
wherein said pre-encode processing unit comprises means for
deriving a frame complexity value and for comparing said
frame complexity value to a predefined complexity threshold,
said means for deriving of said frame complexity value
including means for deriving an accumulated absolute
difference (PIX-DIFF) from adjacent pixels of said plurality
of pixels of said frame.

33. The system of claim 32, wherein when said frame
complexity value is less than said predefined complexity
threshold, said pre-encode processing unit further comprises
means for setting a noisy picture flag to "0" and performing
normal encoding on said frame, wherein said flag set to "0"
designates said frame as a non-noisy or normal frame, and
when said frame complexity value is greater than said
predefined complexity threshold, said pre-encode processing
unit comprises means for determining whether a target
bitrate of said frame is less than a predefined bitrate
threshold, and when said target bitrate of said frame
exceeds said predefined bitrate threshold, said pre-encode
processing unit comprises means for setting said noisy
picture flag to "0", and when said target bitrate of said
frame is less than said predefined bitrate threshold, said
pre-encode processing unit comprises means for setting said
noisy picture flag to "1", wherein said "1" noisy picture

flag setting indicates that said frame includes said random
noise portion.

34. The system of claim 33, wherein said control and
encode unit further comprises means for determining for each
macroblock a macroblock activity level and for determining
when said macroblock activity level exceeds a predefined
activity threshold, wherein said macroblock activity level
exceeding said predefined activity threshold indicates that
said macroblock is within said random noise portion of said
frame.

35. The system of claim 34, wherein said means for
adjusting encoding comprises means for performing motion
estimation on said macroblock and means for selectively
adjusting macroblock coding type for said macroblock to bias
said macroblock towards being coded predictive when said
macroblock activity level exceeds said predefined activity
threshold, said means for selectively adjusting being with
reference to a predictive error value resulting from
performing motion estimation on said macroblock, and wherein
said control and encode unit further comprises means for
determining an adjusted quantization level for said
macroblock for use in encoding said macroblock, said
adjusted quantization level being determined to reduce bits
used in encoding said macroblock.

36. (Amended) The system of claim 35, wherein said
means for adjusting encoding comprises means for conserving
bits used in encoding said at least some macroblocks within
said random noise portion for use in encoding macroblocks
within said normal video portion of said frame.

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37. (Amended) A computer program product comprising a computer usable medium having computer readable program code means therein for use in encoding a frame comprising a plurality of macroblocks, said computer readable program code means in said computer program product comprising:

computer readable program code means for causing a computer to affect using intraframe statistics to determine without reference to another frame whether said frame includes a random noise portion and a normal video portion, and if so, then for each macroblock of said frame said computer program comprises:

computer readable program code means for causing a computer to affect determining a macroblock activity level;

computer readable program code means for causing a computer to affect determining when said macroblock activity level exceeds a predefined threshold, wherein said macroblock activity level exceeding said predefined threshold indicates that said macroblock is associated with said random noise portion of said frame; and

computer readable program code means for causing a computer to affect adjusting encoding of said macroblock when said macroblock activity level exceeds said predefined threshold to conserve bits used in encoding said macroblock by biasing coding of said macroblock associated with

said random noise portion of said frame towards
predictive coding and thereby save bits otherwise
used to encode said random noise portion of said
frame and provide a more constant picture quality
due to encoding of the frame.

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38. (Amended) A computer program product comprising
computer usable medium having computer readable program code
means therein for use in encoding a frame of a sequence of
frames, each frame having a plurality of macroblocks, said
computer readable program code means in said computer
program product comprising:

computer readable program code means for causing a
computer to affect using intraframe statistics to
determine without reference to another frame whether
said frame includes a random noise portion and a normal
video portion; and

computer readable program code means for causing a
computer to affect evaluating each macroblock of said
plurality of macroblocks in said frame and when said
frame includes said random noise portion, adjusting
encoding of at least some macroblocks within said
random noise portion of said frame, said adjusting
comprising reducing bits used in encoding said at least
some macroblocks within said random noise portion by
biasing coding thereof towards predictive coding.